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The Current State Of Emergency Department Information Systems

December 2003

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As have clinical systems in general, emergency department information systems (EDIS) have both matured and grown in popularity over the last several years. Why does an emergency department need its own system? Admittedly, the emergency department shares many of the same functions and activities as other hospital departments: registration, charting, order entry, and results reporting, among others. So what makes an EDIS system unique? This paper examines that question, as well as looking at the current market place, ROI considerations, and presenting a case study of an EDIS implementation.

Components of an EDIS

There are a variety of EDIS on the market. Simplistically, they can be divided into three categories: charting systems, patient tracking systems, and complete emergency department information systems, including both charting and tracking modules. The lines between the three categories are quite often gray, with charting systems including tracking components, vice versa, and all three categories including a host of additional features.

Charting

A charting system/module should: support multiple views, address the requirements of external agencies (such as CMS), include a standard set of fields and templates, work with a variety of input modalities, and be flexible and customizable (with minimal or no intervention of the vendor).

Multiple Views – The three charting views commonly provided in an EDIS are triage, nursing, and physician views. As with all of the components, there is definite overlap in fields and information between the three views. Because different organizations have different concepts as to who should enter what information when (for example, nurses, physicians, and physician assistants may all be involved in triage), **it is important that the different views be easily customizable to suit the environment**.

External Agencies – As with other areas within the hospital, the emergency department has its own set of requirements it must to meet to satisfy external regulatory bodies, including CMS (Center for Medicare and Medicaid Services, formerly know as HCFA) and JCAHO (Joint Commission on Accreditation of Healthcare Organizations).

As described in the CMS Evaluation and Management guidelines[1]: *For Evaluation and Management (E/M) services, the nature and amount of physician work and documentation varies by type of service, place of service and the patient's status.* What does this mean in terms of an EDIS? **A good charting system should not only include fields in which to capture the required information, but it should include logic to determine what documentation is actually required.**

Fields/Templates – Information that should be captured in a charting system include: Assessments, Admission Notes, Allergies, and Discharge Disposition. CMS related fields include: CC (chief complaint), PFSH (Past, Family and/or Social History), HPI (History of Present Illness), ROS (Review of Systems). These lists are by no means all-inclusive, however they serve to illustrate some key features that a good charting system should have:

- When applicable, fields should have a pick list (e.g. discharge disposition, CC)
- Optimally, not only should the system allow for capturing history, but should be able to access and carry forward other encounters/history previously entered into the system.
- The system should have templates that drive the specific information captured. Templates can vary by CC, age (e.g. pediatrics, adults, geriatrics), and gender. Templates not only drive the type of information captured, but can also pre-populate fields, such as specific order sets and treatment plans.

[1] http://www.cms.hhs.gov/medlearn/master1.pdf

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- Templates should not be too restrictive; there should be ample fields to collect any free text, additional information the clinician may want to include.

Input Modalities – The system should support a variety of input modalities. This includes speech recognition and point of care solutions, such as PDAs, laptops, and thin clients. Some systems incorporate touch screens, however the usefulness of this modality is very subjective.

Customizable – The system should be customizable without vendor intervention and preferably without programmer intervention. Pick lists and templates should be table driven or modifiable in such a way that a qualified super user can easily make changes or additions. Screens and views should be modifiable by adding, deleting, or re-arranging fields. A word of caution: many systems today offer the ability to change screens and views, with one caveat – the field must already exist in the underlying database. Adding a field that does not already exist in the database often requires vendor intervention. When assessing the "customability" of a system, accept the fact that there will inevitably be a change that requires the vendor and make sure that such items as turn around time and cost are taken into consideration.

Patient Tracking

There is more to patient tracking than locating a patient at any given time. A good patient tracking system not only replaces the traditional white board, but also enhances the concept by providing the ability to assess the number of patients, condition of patients, and the length of time patients wait between the various phases of a patient encounter. Key features for a patient tracking system include capturing the location of the patient, capturing times for each aspect of the patient encounter, generating alerts, and a "white board" with multiple views. HIPAA provides an excellent reason to move to a systematized patient tracking system or "electronic white board"; the traditional white boards of old do not meet the HIPAA privacy restrictions.

Locating a patient – There are two general categories of patient tracking systems: passive and active.

A passive system is one in which no human interaction (data entry) is required to locate the patient. Tracking is done through a marker, by infrared sensors and radio frequencies. This technology has been used for some time in other industries for asset and personnel tracking and has found it's way into the healthcare industry, using bracelets or badges to locate patients. Passive patient tracking systems can be very limited in terms of the information that is provided, often just giving the location of the patient.

An active system requires input of data to track the patient. In it's simplest and most cumbersome form, patient location is entered manually. Many active systems describe themselves as "real time". Real time systems rely on various means to derive patient location. Data, such as registration, charting, orders, results, entered at various times and places (waiting room, patient room, lab, radiology) is used to show where the patient has been, when he/she has been there and derive where the patient currently is.

Tracking encounter times – regardless of whether a patient is tracked actively or passively, the system needs to capture and store times for each phase of the patient encounter. This data can be used to analyze throughput, workflow, and potential bottlenecks. Some key patient times that should be tracked include: time of triage, time patient is in treatment room, time patient is seen by a nurse, time medications are administered, time patient is discharged. Other times that are not directly related to the patient, but that affect the encounter are the time orders are placed and the time results are reported. As with other modules in an EDIS, customization is important, in this case being the ability to configure user-defined patient care events to capture time for tracking purposes.

Alerts – The ability to generate alerts is intimately tied to tracking encounter times. Capturing time information is not only important for retroactive analysis, but can and should alert caregivers when wait times exceed the user-defined values for phases of care.

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White board – The white board is the interface between the data that is tracked and the user, as well as the primary vehicle through which alerts are delivered. Views should be customizable. There may be specialized views for physicians, nurses, and ED administration, who can use the board for resource management (for example, to note that the waiting room is filled to capacity, and that another triage resource might be appropriate). Other views may include the number of patients waiting for lab tests, x-rays, bed requests, as well as the number of patients in assorted locations.

Hall Beds – Unfortunately most EDs have experienced the problem of not having enough beds. A patient tracking system should be able to recognize the existence of "hall beds" and have the ability to assign a patient to a hall bed.

In addition to charting and patient tracking, there are other modules that are important in an EDIS.

Registration

One of the biggest challenges in an emergency department is patient registration, a relatively easy function for the rest of the hospital. Often in the ED, a patient needs treatment immediately and there is no time for formal registration. Additionally, EMTALA (Federal Emergency Medical Treatment and Active Labor Act) basically states (liberally paraphrased): provide treatment first, ask questions later! Because of this, registration is sometimes performed after triage, sometimes after treatment, and sometimes not at all – in the case of patients who "escape" or walk out prematurely. Adding to the complexity is the fact that registration is usually handled by a different department, either physically, requiring the patient to go to another location, or functionally, requiring a specific skill set for those registering the patient. Some features that an EDIS should have to facilitate registration include:

Quick Registration – a function that captures minimal, basic information that can be entered by ED personnel (as opposed to registration staff). This feature should be able to handle a "John Doe" patient when the identity is unknown.

Chart Merging - The ability to merge a "John Doe" chart with a final patient chart later.

Master Patient Index - Interaction with the EMPI (Enterprise Master Patient Index), i.e. logic that minimizes duplicates within the EDIS, or multiple patient identifiers in multiple systems.

Pre-registration - The ability to pre-register a patient who is en-route (e.g. ambulance, helicopter, doctor's office).

Point of care registration - Whether this is done through the EDIS or the HIS, provisions should be made for point of care registration that can occur at any point in the emergency department encounter. Many EDs have adopted the philosophy that the service should come to the patient, the patient should not have to go to the service - not only should this include ancillary functions such as lab tests and radiology, but registration as well.

Customizable - Provide ability to modify patient registration screens to meet specific ED needs.

Disposition/Discharge

Reducing the amount of time to discharge a patient is very important in an emergency department and an important feature for an EDIS. In fact, it is so important that there are systems on the market that bill themselves as an EDIS, but are really primarily a discharge system. A good discharge module/system can provide "a big bang for the buck." Being relatively inexpensive and easy to implement, this type of system can help an organization easily meet the JCAHO requirement for providing patients with comprehensive educational materials at the time of discharge, which, in turn result in dramatic time savings. Features of a discharge module include:

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Prescriptions – Simplistically, allow legible prescriptions to be generated and printed. This feature alone addresses patient safety through the elimination of hand-written, potentially illegible prescriptions. A more sophisticated implementation of this feature, will actually communicate directly with the pharmacy where the prescription will be filled.

Aftercare instructions – Instructions should be available in multiple languages and modifiable at the patient level.

Work/school notes – Automatically generated.

Discharge dispositions – This feature is a bit more advanced. If the patient is to be admitted or transferred, this can include facilitating a bed request or the transfer by printing the appropriate associated documentation, or communicating electronically with the appropriate institution.

Charge Capture/Billing

Capturing charges is another activity that, while being a challenge to the rest of the hospital, poses more of a problem to the emergency department. The high volume of patients and activity creates an environment where charges can be easily missed or lost. An EDIS should provide tools to help capture charges. In that an EDIS should not be a substitute for a billing/AR system, the EDIS should also come equipped with the ability to pass the charges on to the appropriate system.

Pick Lists – The simplest type of charge capture calls for manually entered charges selected from a pick list.

Supply Cabinets – Automated supply cabinets not only provide a means of capturing charges, but also facilitates inventory management. Before a supply can be removed from the cabinet a patient must be identified. This type of technology can virtually eliminate lost charges for supplies. Clearly, the more powerful system will utilize bar coding for patient identification, but there are systems that will allow a patient identifier to be entered or interactively selected. Although listed here and an invaluable tool for an emergency department, these cabinets are not strictly part of an EDIS. In fact, it might make more sense for the cabinet "to talk" directly with the HIS or billing system.

Code Generation – The strongest type of charge capture module does not capture charges per-se; rather, it generates charges as the encounter is documented. By providing checks and balances to ensure that the encounter is charted correctly (or at least by CMS standards), a good charting/ documenting system also provides the foundation for a good charge-capture system. The system should be able to generate CPT, HCPC, APC, and custom facility supply charge codes, as well as provide a review screen once the encounter is completed. In addition to facilitating reimbursement, a good charge capture module can reduce back-end dictation, transcription, and coding costs.

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Interfaces

The general theme of this paper is that emergency departments are environments that have unique characteristics arguing for (if not requiring) a specialized system. Given that argument, an EDIS needs to have strong interface capabilities – just as it is important for the ED to have its own system, it is equally important for the system to communicate with the rest of the hospital systems.

The types of interfaces that will be needed include:

Bi-directional interface to the HIS ADT - Admissions, discharge and transfer system.

Interaction with the EMPI, generally one-way, to ensure the assignment of the correct patient identifier. If a person may be fully registered through the EDIS, the interface must be bi-directional.

Charge interface.

Bi-directional interfaces to support order and result communication - these interfaces may go directly between the EDIS and ancillary systems, such as lab systems (LIS) and radiology systems (RIS) or may pass through the HIS, or some other central system.

Rather than coming up with a comprehensive list of interfaces (or at least recognizing that there is no such thing in today's rapidly changing environment) and determining whether a specific vendor can accommodate the particular interfaces, a better approach is to view *how* the vendor handles interfaces.

Custom-developed interfaces. Are the interfaces developed for the specific client and system? If so, at what cost and turn-around time? Even though customized, has the EDIS vendor previously developed other interfaces with the same HIS (or other relevant) vendor?

Interface engine. Does the EDIS have an interface engine or tool that can talk to major industry interface engines (e.g. Quovadx or Orion) as well as other vendor systems? Can this tool be easily used by the client to develop his or her own interfaces?

Generally, if the client has access to programming resources and/or a strong integration team, it is preferable to go with a product that has interface development capabilities – in this way control remains in the hands of the client and not the EDIS vendor. If programming resources are an issue, the vendor will have to be involved in interface development – although it is still important that the vendor has the appropriate tools for rapid development, it is arguably more important that they have developed the specific kind of interface before, as well as with the specific recipient vendor product. And lest we forget, all interfaces, regardless of who develops them or how they are developed must be HL7 and HIPAA compliant!

Miscellaneous Features

Although there are many other features that can be included in an EDIS (such as auto-faxing results, auto-paging doctors and other staff, risk management modules) and enhance the operations of an emergency department, those listed here are the core components that make up an EDIS. One other feature that warrants special attention is the ability to accommodate multiple facilities.

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Current Marketplace

The following table shows some of the emergency department information systems available today. Although it is not an exhaustive list, it contains the top players in today's market place, as well as some interesting smaller/newer vendors. Enterprise EDIS modules are not included. The information was collected from vendor Websites and interviews, although some vendors were not available for comment. The highlighted features reflect what the vendors feel their strongest feature is (again either through interviews or what they themselves have highlighted on their Websites), or features that are relatively unique to the vendor.

The components (charting, patient tracking, registration, discharge, interfaces, charge capture) are loosely defined and meant more as a guide to give a sense of what the system is (i.e., a charting system or tracking system, etc.). For example, if a product is not flagged as having registration it does not necessarily mean that you can't register a person into the EDIS, it means that registration is not a primary function and the registration issues as described previously are not addressed specifically by the system. Similarly, if a product is flagged as having discharge capabilities, it may not have all the features previously described, but it has at least some of the specialized functions required by the ED. Under the patient tracking column, some of the products are marked with a "P" for "Passive", rather than a checkmark. The majority of vendors offer active tracking, although most will tell you that they can accommodate passive tracking. These vendors specifically highlight the fact that they have passive tracking.

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Vendor Web Site Product(s)	Comments	Charting	Patient Tracking	Registration	Discharge	Interfaces	Charge capture
A4 www.a4healthsystems.com Healthmatics ED	A comprehensive ED system. Released in 2000 by A4 as Healthmatics ED, its roots are much older, formerly being offered by Nine Rivers Technology as CurrentCare ER. This product, as opposed to the EmStat product, is promoted more by A4. **Highlighted Feature:** Empowerment of the user: Allows easy customization of the system, down to the data, by the user. The system also has strong ad hoc reporting capabilities	√	P	√	√	√	√
A4 www.a4healthsystems.com EmStat ED	A comprehensive ED system, originally released in 1987, acquired by A4 in early 2002. Although this is not the system that is pushed by A4, there are no plans to sunset the product and they are still enhancing the system. **Highlighted Feature:** The EMSTAT Reimbursement Module captures charges for procedures and HCPCS (HCFA Common Procedure Coding System). EMSTAT has also incorporated a point system of Weighted Values for patient care items that do not have HCPCS codes associated with them.	√	√	√	√	√	√
Codonix www.codonix.com Codonix	Dr. Andrew Muchmore founded Codonix in 1995. Its original focus was charting and the system has grown into a comprehensive system including patient tracking capabilities. **Highlighted Feature:** Codonix prides itself on NOT being template-based. It uses object oriented programming to imitate the way a physician practices. Every situation or "medical problem" in the ED is treated as an individual entity with certain inherent properties. Each question answered invokes a series of other, appropriate questions.	√	√		√		√
Emergisoft www.emergisoft.com EmergisoftED	Founded in 1992, Emergisoft Corporation has focused its clinical point of care development efforts on creating a comprehensive, "full-HIS-interface" system for the Emergency Department. **Highlighted Feature:** Since the events of 9/11, many emergency departments have focused attention on bio-terrorism and syndromic surveillance. Emergisoft started their efforts after the 1996 Olympics and contains components that allow for "automated syndromic surveillance" reporting to health departments. Every Emergisoft customer is automatically a participant in syndromic surveillance.	√	√	√	√	√	√
Exit-Writer www.exitwriter.com Exit-Writer	A discharge instruction system developed by a practicing board certified emergency physician. Note: Exit-Writer is incorporated into MedHost's EDMS product. **Highlighted Feature:** The "Referral-Fax" feature ensures continuity of care by automatically faxing to the referral physician a one-page summary of the information provided to each patient discharged.				√	√	

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Vendor Web Site Product(s)	Comments	Charting	Patient Tracking	Registration	Discharge	Interfaces	Charge capture
Healthcare IT www.healthcareit.com EDTracker, EDLog	Healthcare Information Technology, Inc. (Healthcare IT) has been developing software for the healthcare industry since 1997. Their first product, *EDLog*, is a report generator for emergency departments. It comes bundled with *EDTracker*, a passive patient tracking system for the ED. Note: EDTracker is the patient tracking system used by AmeliorED. **Highlighted Feature:** HealthcareIT has a powerful passive patient tracking system. Between the infrared technology that collects physical patient location, and the data feeds from ADT, ancillary, and charting systems, it provides real-time patient status information.		P		√	√	
ibex Healthdata Systems www.ibexhealthdata.com PulseCheck	A comprehensive EDIS developed in 1997 by two practicing emergency medicine physicians and a former hospital CIO. It started more as an emergency medicine physician documentation system, but has evolved to include tracking and other components. **Highlighted Feature:** Ibex has specifically adapted seven features for the small screen (POS): order test sets, main tracking board, chart display, lab results, prescription short list, discharge instructions, and electronic messaging.	√	P	√	√	√	√
MedHost Inc. www.medhost.com EDMS	MedHost was established in 1996. Founded by medical professionals and IT experts, the company leveraged expertise in ED management and customer management software to create a patient management software and communications system. Two years later they introduced a patient tracking system for use in the ED. Note: MedHost is a "preferred partner" for Tenet's patient tracking system. MedHost also incorporates Exit-Writer into its product. *The strong order entry module implies some level of charge capture. **Highlighted Feature:** EDMS includes an order entry module that is specifically designed for use by clinicians to write patient orders electronically and reduce medical errors. EDMS Order Entry also supports physician messaging, results management, patient rounding, and easy access to reference tools.	√	√			√	*
Patient Care Technology Systems www.pcts.com AmeliorED	PCTS entered the emergency department information system market in 2001. It was designed by a team of practicing emergency physicians and nurses and includes advanced clinical support intelligence. Note: Their passive tracking system is actually Healthcare IT's EDTracker product. **Highlighted Feature:** Amelior ED® has a Clinical Intelligence Engine that includes: automated diagnostic reasoning, differential diagnoses and treatment plans; automated medication dosing based on patients' age, weight and diagnosis; drug interaction, allergy and contraindication alerts; point-of-care decision support for rare but life-threatening conditions.	√	P		√		√

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Vendor Web Site Product(s)	Comments	Charting	Patient Tracking	Registration	Discharge	Interfaces	Charge capture
Wellsoft Corporation www.wellsoft.com Home*Easy,* ICMS	Founded in 1988, Wellsoft is a dedicated to emergency department information systems. It is comprised of two main modules: Home*Easy* Patient Discharge Instructions and the Integrated Clinical Management System (*ICMS*). **Highlighted Feature:** Risk management features are built directly into Well*soft*"s Integrated Clinical Management (ICMS) System and have always been inherent to the design of the software. RM features include a sophisticated prompting system to avoid risks, while processing orders and single keystroke access to reference documents, guidelines, site-specific information or web-based material.	√	√	√	√	√	√
T-Systems www.tsystem.com T-SystemEV	T-System was formed 1996. Today, The T-System® paper template system is used by more than 30% of all U.S. emergency departments (over 1400). T-System has now introduced a comprehensive EDIS based upon their popular paper templates: T-SystemEV. **Highlighted Feature:** A charting system that electronically replicates the most popular manual form of documentation used in emergency departments.	√	√		√		√
Tenet www.tenetinfo.com EdNet32	A comprehensive ED system, originally released in 1986. Sold in three tiers, with the simplest tier basically composed of an aftercare module. Note: MedHost is a “preferred partner” for Tenet Patient Tracking. **Highlighted Feature:** The *ED*Net System has been designed from day one for full support of multi-hospital and large enterprise installations.	√	√	√	√	√	√
VitalWorks www.vitalworks.com EMStation, EMTrack	VitalWorks offers software solutions to a wide variety of office-based and hospital-based medical specialties. The emergency room components have been available for about ten years. Note: VitalWorks is an Allied Partner of Siemens Health Services and EMstation has been used in conjunction with Siemens HIS in many EDs around the country. **Highlighted Feature:** The VitalWorks solution includes a fairly comprehensive billing module with on-screen edit checks to reduce errors, automatic insurance claim tracking, electronic claim submission and patient statement processing, daily billing, multiple fee schedules for each provider and billing location, and can accommodate up to four diagnoses per procedure.	√	√	√	√	√	√

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ROI Considerations

As with other clinical systems, it is difficult to come up with a concrete ROI for an EDIS. Having said that, it is useful to look at return on investment from three perspectives: increased revenue, cost reduction, and quality of service improvements. Following are some of the ways an ROI might be evaluated:

Increased Revenue

Lost Charges - Due to the frenetic nature of the emergency department, it is practically a given that there are lost charges, ranging from individual charges missing from a specific encounter to patients who have left without being completely registered. Lost charges per encounter can be estimated using the following equation:

ED visits per year x Percent of charts with charging errors x Average loss per chart = $ Lost Charges

In that many organizations do not have a good dollar figure on lost charges (after all, they are lost!), the following figures may provide a useful estimate[2]: Charts with charging errors – 35%, Average lost per chart – $25. Using the national average for number of ED visits per year, as of 2000 [3]:

27,000 x 35% x $25 = $236,250.00

Under the assumption that a good EDIS will eliminate *all* lost charges, this can translate to a net revenue increase of $70,875 to $118,125 (assuming a 30 to 50 percent payment of billed charges).

Optimize reimbursement – Another way in which revenue is potentially increased, but far less measurable is through coding. Not only will a good charting system help prevent lost charges, but by providing checks, balances, and generating appropriate codes for the encounter, the system can maximize the allowable charges per patient.

Cost Reduction

Much of the cost reduction that can be gained from an EDIS comes from labor reduction. Caution must be used when translating labor reduction into a dollar amount – often, a reduction of labor does not effectively translate into a reduction of FTEs. It is dependent on the job or activity: saving a nurse or physician time on their various activities will probably not reduce the number of nurses or physicians, but may increase the quantity of work they are able to complete (also virtually impossible to measure); jobs that are more discrete with one primary function, such as transcription or coding, may be eliminated entirely depending on the success of the implementation. A final note of caution in translating labor into cost savings: even if the goal is to reduce/eliminate FTEs, chances are that they will not go away “immediately”, it is best to plan for some amount of overlap between going live and eliminating employees.

Dictation/transcription expenses – In that transcription is usually a distinct department or outsourced, this is arguably the “cleanest” elimination of labor. Organizations have successfully eliminated this function altogether by having nurses and physicians enter the information directly into the charting system.

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[2] The Center for Medical Education, Inc. conducted 14 lost charge audits for hospitals. These audits consistently demonstrated that hospitals are losing large quantities of charges. In the 14 audits, an average of 35% (range 16-58%) of charts were noted to have charging errors and the average loss per chart audited was $25 (range $7-$55).

[3] http://www.cdc.gov/nchs/releases/02news/emergency.htm - National Center for Health Statistics Press Release

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Orders transcription/billing – Similar to the transcription of encounter information, order transcription and translating orders into appropriate billing codes are often outsourced or have dedicated resources to perform this function. The labor can be reduced by a system that generates charges and/or from the encounter documentation, potentially reducing a department to a single individual that reviews the charges, as opposed to creating them.

Unnecessary/duplicate orders – Not only can a charting system maximize allowable charges (as noted above), it can eliminate unnecessary and duplicate orders, reducing the number of denied/unallowable charges.

Computerization of management reports and logs – This may be one of the harder savings to quantitatively measure but one of the biggest “emotional” bangs for the buck. The emergency department has extensive reporting requirements, such as the JCAHO ED Log. These reports are very time-consuming to prepare. Once all the ED information is in the system, the reports may be produced “at the push of a button”, saving not only time, but also reducing frustration.

Quality Improvements

Quality improvements are those items which improve service for the patient or staff, but cannot be quantitatively identified (at least, easily) as savings. These are just some of the quality improvements that can result from an EDIS:

Reduced throughput time for patients - Because of the automated alerts (such as a patient sitting in the waiting room for too long, a patient who has been triaged but not seen by a physician, “lost” results).

Improved documentation of information

Rapid retrieval of past data on patient visits

Quality tracking - Turnaround times, return rates, AMA rates

Reduced medical errors – System-generated prescriptions versus hand-written, potentially illegible prescriptions alone will reduce medical errors. If the EDIS has more sophisticated clinical alerts, or interfaces with a system that has clinical alerts, the reduction of medical errors can be even greater and even somewhat quantifiable (although this might be stretching it a bit for an EDIS ROI):

ED visits per year x 1.25% (Estimated ADEs [4]) x $4,700 (Cost per ADE [4]) = Associated Cost
Associated Cost x 70% (Potential reduction [4]) = $ Potential Savings

27,000 x 1.25% x $4,700 = $1,586,250
$1,586,250 x 70% = $1,110,375

There are benefits to be derived from an EDIS. Although the benefits are largely unquantifiable, with a few statistics and some (creative) thinking, a financial case can be made for an EDIS, as illustrated. Again, while not an ROI, one very real reason that can be used to justify the purchase of an EDIS is the fact that the white board of old will not support HIPAA requirements.

[4] Estimates derived from the IOM report: To Err is Human – Building a Safer Health System

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Case Study – Sherman Hospital, Elgin, Illinois

Following is a case study about an EDIS implementation. At first glance, Sherman Hospital may not look like the optimal choice for a case study, having only implemented some of the available EDIS modules - they do, however, serve to illustrate some key points. First and foremost - they have only implemented some of the available EDIS modules. This is key because it is typical of most EDIS implementations. Between the fact that most vendors price individual modules of their EDIS separately, and that many organizations choose to implement larger systems with a phased approach, there are relatively few "complete" EDIS installations. Another point that can be drawn from the Sherman Hospital EDIS implementation, is that although they have implemented a fraction of what they want to in their ED, they are happy with what they have done so far, and have experienced a favorable and *measurable* ROI.

History

In 1989, Dr. Frank Pangallo became the Medical Director of the Emergency Department at Sherman Hospital, Elgin, Illinois. He was ahead of his time – the first thing he wanted to do was to implement an information system in the emergency department. His main goal at that time was to implement a system that tracked patient management information: number of patients, and timing of assorted events within the encounter.

Back in the eighties, Emergency Department Information Systems (EDIS) were virtually non-existent and so Sherman Hospital's options were limited. They even considered hiring the programmer wife of one their radiologists to write a system, but that option proved to be too expensive. In 1994 they went live with the EdNet product and used it until 2002, when the decision was made to look for a new EDIS.

The Challenge

The search for a new EDIS was initiated and driven by clinical, non-IT personnel; physicians were still doing their documentation manually and dictating their notes. The transcription was outsourced and the cost was simply too high. A goal was set to eliminate, or at least reduce, this cost by November 2002.

The EdNet system was still in place but primarily used for patient tracking, and the EdNet system was not making the strides in physician and nursing documentation that Sherman hospital felt they needed. They decided to look for a new EDIS vendor.

Vendor Search

Led by Dr. Pangallo, a search began for a new EDIS system. With the help of the Associate Director of the ED, and the Director of Emergency Services for Nursing, Dr. Pangallo conducted a review of systems, including taking a look at the offering from their future HIS (hospital information system) vendor, Cerner's *FirstNet®* Emergency Medicine Information System. They discovered, as have many, that generally, best of breed, niche systems still have more to offer than their enterprise system counterparts. After having received quotes from three vendors, Dr. Pangallo and his team finally chose ibex, with one of the primary reasons being that it seemed to be an easier system to use than others.

Implementation

The decision to go with ibex was made on May 6, 2002. At this point in time, the Sherman Hospital IT department became involved, and with the combined efforts of the ED staff, IT staff, and ibex, five months later, in October 2002, the Sherman Hospital emergency department went live on the ibex triage, tracking, physician documentation, and discharge modules, in addition to an ADT (Admissions, Discharge, Transfers) interface with their HIS.

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The implementation went well. Among the several factors responsible for this success are clinician involvement, vendor support, training and “go live” support.

Clinician Involvement - Because a clinician not only initiated the project, but also was responsible for system selection, the clinicians were already well vested in the new software. Dr. Pangallo also had the added advantage of being the boss - this does not mean that he strong-armed his staff; it simply means that he was in a better position to influence them and **champion the project** – a critical component for a clinical system implementation.

Vendor Support - ibex was on-site extensively throughout the implementation and for the first full four days after going live. When customization was needed, such as a modification that Sherman required on the triage screen, ibex was responsive and timely.

Training and Go Live Support - As with any system installation, adequate training is critical. Not only does everyone who will use the system need to be trained, but training should also be tailored to suit the needs of different groups. In this implementation, ibex trained super users, who in turn trained non-physician users in a classroom setting. Recognizing the need for a more specialized, focused training for the physicians, the Sherman Hospital IT project leader, Andrea DeLeon, took it upon herself to train each of the physicians one-on-one. This ensured that each physician was comfortable with and prepared to use the system.

Upon going live (and as previously noted), ibex was on site for the first four days. Additionally, the information technology staff worked all three shifts, realizing that no matter how well trained the users were, actually using the system for the first time was a whole different story. The 24-7 support provided by the IT Department went a long way towards making the implementation successful.

Benefits

Sherman Hospital does not have the most sophisticated EDIS implementation. It has installed only some of the available ibex EDIS modules. It has not enhanced the product with such features as wireless technology (information is collected manually at the bedside and entered on three PCs by the nursing station that are dedicated to the physicians) or voice recognition. Yet, the project is still considered to be a success and has provided Sherman Hospital with a real return on investment.

The problem they set out to address has indeed been resolved! Outsourcing transcription was too expensive - $350,000 per year. Because physician charting is now handled through the system, physicians enter documentation themselves directly into the system, eliminating the need for transcription and thus the transcription fee. Sherman hospital has about 150 templates set up to make the chart entry process easier for the physicians. The physician also types free text information in, and although this required the purchase of additional software that teaches the doctors how to type, the amount spent on typing software was well worth the money saved on transcription.

Another benefit that has resulted from the EDIS install is improved gross billing. The templates have provided a structure that facilitates the capture of related (previously missed) charges. Simply, templates provide for more thorough charge capture, more charges translate to higher gross billing, higher gross billing results in more money collected.

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What's Next?

As of this writing, Sherman Hospital is in the process of implementing an interface to their lab system so that results will go directly into the EDIS. Like so many other organizations, Sherman Hospital has finite resources. They have many IT projects in the works, that go beyond the ED, and must prioritize when and what they do. Dr. Pangallo would love to finish implementing the remaining ibex modules, such as nursing documentation and given the success of physician documentation, this would no doubt result in increased quality and reduced turn-around time. Other projects on his wish list include the implementation of point of care technology (hand-helds by the bedside), voice recognition, and infrared patient tracking (all methods of easing entering data into the system).

What the folks at Sherman Hospital have realized is that even though they are not in a position to implement their entire EDIS wish list at this point, each module they install or enhancement they make (even something as relatively simple as an interface) has the potential to increase quality, reduce turnaround time, and provide a ROI. Taking one step at a time, they will continue to move towards a fully automated Ed.

Summary

It is fairly obvious that an emergency department can benefit from a system that is customized for that environment.

Financial ROI justification for an EDIS is difficult, but not impossible to calculate. Lost charges and transcription costs are two areas where an organization can start to come up with some solid numbers. Using industry standards and some creative thinking, other areas can be translated into dollar amounts reflecting potential revenue increases and cost savings.

There are many non-financial justifications for implementing an EDIS. These include faster throughput and turn-around time for patients, physicians, nurses, data access and exchange, and, of course, increased patient safety, through system generated prescriptions and clinical alerts. Even external forces, such as HIPAA, help the cause; the old fashioned white board does not meet the privacy regulations.

Cost of an EDIS system does not have to be the limiting factor. The systems come in all shapes and sizes, ranging from simple discharge systems to comprehensive systems that include clinical decision support. The larger systems are usually modular, allowing for a phased implementation, and thus "phased pricing." As shown in the Sherman Hospital case study, even a partial EDIS implementation can yield many, positive results.

To conclude – go for it! Assess the needs of the ED. Translate these needs into a financial ROI, where possible, and qualitative benefits where it is not. Review the available systems (the product table in this document is a good place to start). Decide what you can spend now and down the road. With the range and maturity of the products that are available today, there IS an EDIS that meets just about every organization's needs, priorities, and cost limitations.

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Glossary

APC (Ambulatory Payment Classification Groups)
A prospective payment system (PPS) under Medicare for hospital outpatient services: such patients would include those treated in an emergency department or outpatient surgery or clinic. All services paid under the PPS are classified into groups called Ambulatory Payment Classifications or APCs. Services in each APC are similar clinically and in terms of the resources they require. A payment rate is established for each APC. Depending on the services provided, hospitals may be paid for more than one APC for an encounter.

Chief Complaint (CC)
The CC is a concise statement describing the symptom, problem, condition, diagnosis, physician recommended return, or other factor that is the reason for the encounter, usually stated in the patient's words. *CMS (HCFA)Guidelines*

Past, Family and/or Social History (PFSH)
The PFSH consists of a review of three areas: past history (the patient's past experiences with illnesses, operations, injuries and treatments); family history (a review of medical events in the patient's family, including diseases which may be hereditary or place the patient at risk); and social history (an age appropriate review of past and current activities). *CMS (HCFA)Guidelines*

History of Present Illness (HPI)
The HPI is a chronological description of the development of the patient's present illness from the first sign and/or symptom or from the previous encounter to the present. It includes the following elements: location, quality, severity, duration, timing, context, modifying factors, and associated signs and symptoms. *Brief* and *extended* HPIs are distinguished by the amount of detail needed to accurately characterize the clinical problem(s). *CMS (HCFA)Guidelines*

Review of Systems (ROS)
A ROS is an inventory of body systems obtained through a series of questions seeking to identify signs and/or symptoms which the patient may be experiencing or has experienced. *CMS (HCFA)Guidelines*

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